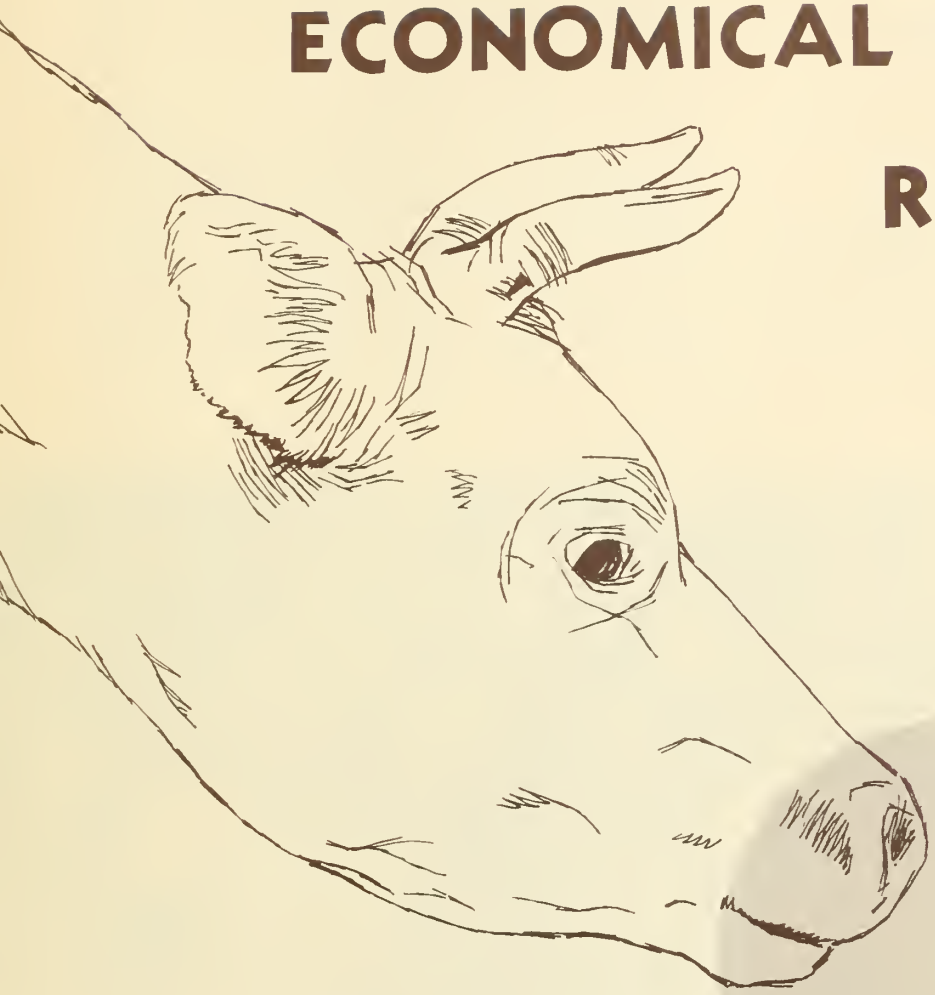
Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

USDA
NAT'L AGRIC LIBRARY
1948 AUG -9
CURRENT SERIAL RECORDS
ACQ/SERIALS BRANCH

ECONOMICAL DAIRY RATION



Leaflet No. 433

UNITED STATES DEPARTMENT OF AGRICULTURE

Selecting an ECONOMICAL DAIRY RATION

When you make up a dairy ration, the main points to consider are:

- Total digestible nutrients (TDN).
- Digestible protein.
- Cost of the feeds in relation to your milk income.

Select feeds that furnish (1) the most TDN at the least cost and (2) enough digestible protein.

Feed your cows all the good roughage they will eat because nutrients in roughage cost less than nutrients in concentrates.

The amount of protein your cows need in the form of grains and other concentrates depends on the protein content of the hay, silage, or other roughage that you feed.

Good roughage provides nutrients for considerable milk. Feed concentrates to get additional milk. Concentrates generally are the most expensive feed; watch how the feed price compares with the milk price in your locality. You can afford to increase the amount of concentrates in the ration as long as the amount of money you get for extra milk is greater than the amount you pay for extra concentrates.

Feed your cows all the good roughage they will eat.

Feed your cows concentrates to get additional milk.

Table 1.—Concentrate mixtures to feed with different roughages

When you feed—	You need in the concentrate mixture—	To make this mixture, use—		
		Low-protein concentrates	Medium-protein concentrates	High-protein concentrates
	Percent of protein	Parts by weight	Parts by weight	Parts by weight
A First-quality legume hay or silage or better-than-average pasture	12	6 +	3 +	1
B Average-quality legume hay or silage, or good-quality mixed hay or silage, or good corn and sorghum silage or average pasture	14	6 +	2 +	2
C Average-quality mixed hay and corn or sorghum silage or below-average pasture	16	5 +	2 +	3
D Grass hay and corn silage	18	4 +	3 +	3

Each day, feed your cow at least 2½ pounds of roughage (hay-equivalent basis) for each 100 pounds of body weight—25 pounds per day for a 1,000-pound cow. "Hay-equivalent basis" means that, if hay and silage are fed together, 3 pounds of silage or pasture will replace 1 pound of hay. Six-tenths pound of concentrates will furnish as much TDN as 1 pound of hay or 3 pounds of silage.

HOW TO CHOOSE CONCENTRATES

Table 1 shows concentrate mixtures that you feed with different roughages.

Suppose your roughage is good-quality mixed hay and good corn silage. According to table 1, this is "B"-quality roughage. You need to feed a concentrate mixture that has 14 or 15 percent of protein.

If You Prepare Your Own Mixture

Now, suppose you have the following concentrates or you can buy them at the prices given:

Wheat bran at $65 per ton; No. 2 corn at $60; oats at $50; molasses (cane) at $40; corn gluten feed at $70; linseed meal at $80; cottonseed meal at $90; and barley at $55.

To find the cost of 100 pounds of TDN in each of these, refer to the list of concentrates in table 2. You find wheat bran in the medium-protein group and, after it, a list of prices. The column headed "$65" gives $4.86 as the cost of 100 pounds of total digestible nutrients.

LIBRARY
COASTAL PLAIN EXPERIMENT STATION
TIFTON, GEORGIA

Table 2.—Cost of 100 pounds of total digestible nutrients (TDN) in various concentrates at different prices per ton

PRICE PER TON	$25	$30	$35	$40	$45	$50	$55	$60	$65	$70	$75	$80	$85	$90	$95	$100
CONCENTRATES																
LOW-PROTEIN FEEDS																
Alfalfa-molasses feed	2.44	2.93	3.15	3.90	4.39	4.88	5.37	5.86	6.34	6.83	7.32	7.81	8.30	8.78	9.27	9.76
Barley	1.61	1.93	2.25	2.58	2.90	3.22	3.54	3.86	4.19	4.51	4.83	5.15	5.47	5.80	6.12	6.44
Beet pulp, dried	1.82	2.18	2.55	2.91	3.28	3.61	3.97	4.34	4.70	5.07	5.43	5.79	6.16	6.52	6.89	7.25
Beet pulp, molasses, dried	1.72	2.06	2.41	2.76	3.10	3.44	3.89	4.24	4.58	4.92	5.27	5.62	5.96	6.30	6.65	7.00
Citrus pulp, dried	1.67	2.00	2.33	2.67	3.00	3.34	3.67	4.10	4.44	4.77	5.11	5.44	5.77	6.11	6.44	6.78
Citrus pulp, molasses, dried	1.62	1.94	2.27	2.59	2.92	3.24	3.56	3.89	4.12	4.54	4.86	5.19	5.51	5.83	6.16	6.48
Corn, no. 1 grade	1.52	1.82	2.13	2.43	2.74	3.04	3.35	3.66	3.96	4.26	4.57	4.88	5.18	5.48	5.79	6.10
Corn, no. 2 grade	1.56	1.87	2.18	2.50	2.81	3.12	3.43	3.74	4.06	4.37	4.68	4.99	5.30	5.62	5.93	6.24
Corn, soft or immature	2.06	2.47	2.89	3.30	3.71	4.12	4.54	4.95	5.36	5.78	6.19	6.60	7.02	7.43	7.84	8.26
Corn and cob meal	1.71	2.05	2.39	2.74	3.08	3.42	3.76	4.10	4.45	4.79	5.13	5.47	5.81	6.16	6.50	6.84
Distillers' rye grains, dried	2.12	2.54	2.97	3.39	3.81	4.24	4.66	5.08	5.50	5.93	6.35	6.77	7.20	7.62	8.04	8.46
Feterita grain	1.57	1.88	2.20	2.51	2.82	3.14	3.45	3.76	4.07	4.39	4.70	5.01	5.33	5.64	5.95	6.26
Feterita head chops	1.72	2.06	2.41	2.76	3.10	3.44	3.89	4.24	4.58	4.92	5.27	5.62	5.96	6.30	6.65	7.00
Grapefruit pulp, dried	1.70	2.04	2.38	2.72	3.06	3.40	3.74	4.08	4.43	4.77	5.11	5.45	5.79	6.13	6.47	6.81
Hegari grain	1.47	1.76	2.06	2.35	2.65	2.94	3.23	3.53	3.82	4.12	4.41	4.70	5.00	5.29	5.59	5.78
Hominy feed, 5-percent or more fat	1.19	1.43	1.67	1.90	2.14	2.38	2.62	2.86	3.09	3.33	3.57	3.81	4.05	4.28	4.52	4.76
Kafir grain	1.54	1.85	2.15	2.46	2.77	3.08	3.38	3.69	4.00	4.30	4.61	4.92	5.22	5.53	5.84	6.14
Milo grain	1.58	1.90	2.21	2.52	2.84	3.15	3.47	3.80	4.12	4.43	4.75	5.06	5.38	5.69	6.01	6.32
Milo head chops	1.68	2.02	2.35	2.69	3.03	3.36	3.70	4.04	4.38	4.71	5.05	5.39	5.72	6.06	6.40	6.74
Molasses, beet	2.06	2.47	2.89	3.30	3.71	4.12	4.54	4.95	5.36	5.78	6.19	6.60	7.02	7.43	7.84	8.26
Molasses, cane	2.32	2.78	3.25	3.72	4.18	4.64	5.11	5.58	6.04	6.50	6.97	7.44	7.90	8.36	8.83	9.30
Oats	1.78	2.14	2.49	2.85	3.21	3.56	3.92	4.28	4.64	4.99	5.35	5.71	6.06	6.42	6.78	7.14
Oat mill feed	3.36	4.04	4.72	5.40	6.08	6.76	7.44	8.11	8.79	9.47	10.15	11.83	12.51	13.19	13.87	14.15
Orange pulp, dried	1.60	1.92	2.24	2.56	2.88	3.20	3.51	3.83	4.15	4.47	4.79	5.11	5.43	5.75	6.07	6.38

Potato meal, dried	1.78	2.14	2.49	2.85	3.21	3.56	3.92	4.28	4.64	4.99	5.35	5.71	6.06	6.42	6.78	7.14
Potato pulp, dried	1.60	1.92	2.24	2.56	2.88	3.20	3.51	3.83	4.15	4.47	4.79	5.11	5.43	5.75	6.07	6.38
Rye	1.64	1.97	2.29	2.62	2.95	3.28	3.60	3.93	4.26	4.58	4.91	5.24	5.56	5.89	6.22	6.54
Sorghum grain	1.56	1.87	2.18	2.50	2.81	3.12	3.43	3.74	4.06	4.37	4.68	4.99	5.30	5.62	5.93	6.24
Wheat	1.56	1.87	2.18	2.50	2.81	3.12	3.43	3.74	4.06	4.37	4.68	4.99	5.30	5.62	5.93	6.24
Whey	1.60	1.92	2.24	2.56	2.88	3.20	3.51	3.83	4.15	4.47	4.79	5.11	5.43	5.75	6.07	6.38
MEDIUM-PROTEIN FEEDS																
Alfalfa leaf meal, dehydrated	2.30	2.76	3.22	3.68	4.14	4.60	5.06	5.52	5.98	6.44	6.90	7.36	7.72	8.08	8.54	9.00
Beans, field	1.59	1.91	2.23	2.54	2.86	3.18	3.50	3.82	4.13	4.45	4.77	5.09	5.41	5.72	6.04	6.36
Brewers' grain, dried, less than 25-percent protein	2.02	2.42	2.83	3.23	3.64	4.04	4.44	4.85	5.25	5.66	6.06	6.46	6.87	7.27	7.68	8.08
Coconut oil meal, expeller process	1.62	1.94	2.27	2.59	2.92	3.24	3.56	3.89	4.12	4.54	4.86	5.19	5.51	5.83	6.16	6.48
Corn gluten feed	1.69	2.03	2.36	2.70	3.04	3.38	3.71	4.05	4.39	4.72	5.06	5.40	5.73	6.07	6.41	6.74
Distillers' corn grain, dried	1.18	1.42	1.66	1.89	2.13	2.37	2.61	2.85	3.08	3.32	3.56	3.80	4.04	4.27	4.51	4.75
Distillers' wheat grain, dried	1.60	1.92	2.24	2.56	2.88	3.20	3.51	3.83	4.15	4.47	4.79	5.11	5.43	5.75	6.07	6.38
Peas, field, or pea meal	1.61	1.93	2.25	2.58	2.90	3.22	3.54	3.86	4.19	4.51	4.83	5.15	5.47	5.80	6.12	6.44
Rye middlings	1.74	2.08	2.43	2.78	3.12	3.47	3.82	4.17	4.51	4.86	5.21	5.56	5.90	6.25	6.60	6.94
Wheat bran	1.87	2.24	2.62	2.99	3.37	3.74	4.11	4.49	4.86	5.24	5.61	5.98	6.36	6.73	7.11	7.48
Wheat middlings	1.62	1.94	2.27	2.59	2.92	3.24	3.56	3.89	4.12	4.54	4.86	5.19	5.51	5.83	6.16	6.48
Yeast, added cereal, dried	1.70	2.04	2.38	2.72	3.06	3.40	3.74	4.08	4.43	4.77	5.11	5.45	5.79	6.13	6.47	6.81
HIGH-PROTEIN FEEDS																
Corn gluten meal	1.57	1.87	2.19	2.50	2.81	3.13	3.44	3.75	4.07	4.38	4.70	5.01	5.32	5.64	5.95	6.26
Cottonseed meal, 45-percent protein	1.66	1.99	2.33	2.66	2.99	3.32	3.66	3.99	4.32	4.66	4.99	5.32	5.66	5.99	6.32	6.66
Fish meal	1.76	2.11	2.47	2.82	3.17	3.52	3.88	4.23	4.58	4.94	5.29	5.64	6.00	6.35	6.70	7.06
Linseed meal, expeller process	1.66	1.97	2.28	2.59	2.90	3.22	3.53	3.84	4.15	4.46	4.77	5.08	5.39	5.70	6.01	6.32
Linseed meal, solvent process	1.78	2.14	2.49	2.85	3.20	3.56	3.92	4.27	4.63	4.98	5.34	5.70	6.05	6.41	6.76	7.12
Peanut oil meal, expeller process	1.64	1.97	2.30	2.63	2.96	3.29	3.62	3.95	4.28	4.61	4.93	5.26	5.59	5.92	6.25	6.58
Peanut oil meal, solvent process	1.82	2.18	2.55	2.92	3.28	3.64	4.01	4.38	4.74	5.10	5.47	5.84	6.20	6.56	6.93	7.30
Sesame oil meal	1.75	2.10	2.45	2.80	3.15	3.50	3.86	4.21	4.56	4.91	5.26	5.61	5.96	6.31	6.66	7.02
Skim milk, dried	1.57	1.88	2.20	2.51	2.82	3.14	3.45	3.76	4.07	4.39	4.70	5.01	5.33	5.64	5.95	6.27
Soybeans	1.59	1.91	2.23	2.54	2.86	3.18	3.50	3.82	4.13	4.45	4.77	5.09	5.41	5.72	6.04	6.36
Soybean oil meal, expeller process	1.60	1.92	2.24	2.56	2.88	3.20	3.52	3.84	4.17	4.49	4.81	5.13	5.45	5.77	6.09	6.41
Soybean oil meal, solvent process	1.60	1.92	2.24	2.56	2.88	3.20	3.52	3.84	4.16	4.48	4.80	5.12	5.44	5.76	6.08	6.40
Yeast, dried	1.72	2.06	2.41	2.75	3.09	3.44	3.78	4.12	4.46	4.81	5.15	5.49	5.84	6.18	6.52	6.86

If you do the same thing for each of the other concentrates, the costs are:

	Cost of 100 pounds of TDN
Low-protein concentrates:	
Corn, No. 2 grade at $60 per ton	$3.74
Barley, at $55 per ton	3.54
Molasses (cane), at $40 per ton	3.72
Oats, at $50 per ton	3.56
Medium-protein concentrates:	
Wheat bran, at $65 per ton	4.86
Corn gluten feed, at $70 per ton	4.72
High-protein concentrates:	
Linseed meal (expeller process), at $80 per ton	5.08
Cottonseed meal, at $90 per ton	5.99

Table 1 shows that when you feed a concentrate mixture with "B"-quality roughage you use 6 parts low-protein concentrates, 2 parts medium-protein concentrates, and 2 parts high-protein concentrates. Use barley for the low-protein part of the ration because it is the cheapest of the 4 low-protein concentrates. Use corn gluten feed as the medium-protein concentrate and linseed meal as the high-protein concentrate. The final mixture, therefore, is 6 parts barley, 2 parts corn gluten feed, and 2 parts linseed meal (all parts by weight).

This concentrate mixture supplies plenty of protein for feeding with "B"-quality roughage.

Mixtures with few ingredients are just as good as those with numerous ingredients. If you have excellent-quality legume roughage, you can make a good, low-cost mixture with single grains—such as corn, oats, barley, or a mixture of them—and 10 to 20 percent of wheat bran or mill run.

If You Buy Ready-Mixed Concentrates

When you buy ready-mixed concentrates, choose a mixture with a protein content that fits your roughage; see table 1. Make sure the mixture has a low fiber content and includes ingredients rich in total digestible nutrients. Feeding more protein than is needed is wasteful.

HOW TO FEED CONCENTRATES

Barn Feeding

Table 3 is a general guide for feeding concentrates under average barn-feeding conditions when milk, roughage, and concentrate prices are at different levels.

Cows were fed concentrates in different amounts with plenty of average-quality roughage—referred to in table 1 as "B"-quality roughage. The milk production was measured. Recommendations in table 3 are based on this experiment. They take into account the milk-concentrate price relationship and the milk-roughage price relationship for different price levels.

Use more concentrate when it is cheap in relation to roughage. Use more concentrate when milk prices are high in relation to either concentrate or roughage, or both. Use less concentrate when it is expensive in relation to roughage.

On good pasture, cows can graze their fill several times daily.

Table 3.—Estimated most profitable level to feed concentrates at different price relationships for milk, concentrates, and roughage (hay-equivalent basis). Divide daily milk production for each cow by the appropriate number. This will give you the number of pounds of concentrate to feed

A. Price of 100 pounds of milk: $2.75

Cost of concentrate (100 pounds) / Cost of roughage (1 ton)	$2.00	$2.50	$3.00	$3.50	$4.00
$20	3.0	4.5	6.0	9.0	22.0
$25	2.5	3.5	5.0	8.0	16.0
$30	2.3	3.3	4.5	7.0	14.0
$35	1.8	3.0	4.0	6.0	10.0
$40	1.5	2.5	3.5	5.5	8.0

B. Price of 100 pounds of milk: $3.25

Cost of concentrate (100 pounds) / Cost of roughage (1 ton)	$2.00	$2.50	$3.00	$3.50	$4.00
$20	2.5	3.5	4.2	6.0	10.0
$25	2.3	3.2	4.0	5.7	8.5
$30	2.0	3.0	3.5	5.0	7.0
$35	1.7	2.5	3.2	4.5	6.5
$40	1.5	2.2	3.0	4.0	6.0

C. Price of 100 pounds of milk: $3.75

Cost of concentrate (100 pounds) / Cost of roughage (1 ton)	$2.00	$2.50	$3.00	$3.50	$4.00
$20	2.3	3.0	3.7	5.0	7.0
$25	2.0	2.7	3.5	4.5	6.0
$30	1.8	2.5	3.3	4.0	5.5
$35	1.5	2.3	3.0	3.8	5.0
$40	1.0	1.5	2.5	3.3	4.5

D. Price of 100 pounds of milk: $4.25

Cost of concentrate (100 pounds) / Cost of roughage (1 ton)	$2.00	$2.50	$3.00	$3.50	$4.00
$20	2.5	2.8	3.5	4.0	5.0
$25	2.0	2.5	3.2	3.8	4.5
$30	1.8	2.3	3.0	3.5	4.3
$35	1.5	2.0	2.6	3.3	4.0
$40	1.2	1.8	2.5	3.0	3.5

E. Price of 100 pounds of milk: $4.75

Cost of concentrate (100 pounds) / Cost of roughage (1 ton)	$2.00	$2.50	$3.00	$3.50	$4.00
$20	2.0	2.5	3.0	3.5	4.5
$25	1.7	2.3	2.8	3.4	4.0
$30	1.5	2.0	2.5	3.2	3.8
$35	1.2	1.8	2.3	3.0	3.6
$40	1.0	1.5	2.0	2.5	3.5

Here is the way to use table 3 as a guide to feeding concentrates to your cows:

Suppose milk sells for $3.25 per 100 pounds, concentrate costs $3.00 per 100 pounds, and your roughage (hay-equivalent basis) is worth $25 per ton. Look at table 3–B. Read across the $25 line to the $3.00 column. The figure is 4. This tells you to feed 1 pound of concentrate for each 4 pounds of milk per cow per day.

When milk sells for $4.25, roughage costs $30, and concentrates cost $3.50, the rate of feeding would be 1 pound of concentrate to 3.5 pounds of milk produced daily.

Farmers with plenty of top-quality roughage can feed 20 to 25 percent less concentrate than recommended in this guide.

Pasture Feeding

A cow on pasture usually will give more milk if she receives supplementary feed. The amount of supplementary feed she needs depends on how good a pasture she is grazing. It also depends somewhat on the butterfat test of her milk.

The amount of milk of different butterfat content that an average cow on good and average pasture should produce is given in table 4. This table includes a guide to supplementary feeding for cows on pasture.

Good pasture is young, succulent, and abundant enough so that cows can graze their fill in 1 to 1½ hours several times daily.

Average pasture is short and young, or of somewhat advanced growth, and is not palatable or abundant enough to permit cows to graze their fill in 2 to 3 hours several times daily.

Poor pasture will no more than maintain the weight of cows. Cows may need some hay, silage, and grain to maintain their weight if the pasture is very poor.

Table 4.—Supplementary feeding schedule for cows on pasture

Butterfat test of milk (percent)	Pounds of milk daily that pasture alone should produce		Pounds of roughage or concentrate needed to produce each additional 5 pounds of milk daily		
	Good pasture	Average pasture	Roughage		Concentrate
			Hay	Corn silage	
3	40	20	3.3	10.0	2.0
4	30	15	3.7	11.0	2.2
5	25	12	4.2	12.5	2.5
6	20	10	4.7	14.0	2.8

The recommendations for feeding milk cows given in these tables were thoroughly tested and will give economical milk production under most conditions.

●

Prepared by Animal Husbandry Research Division, Agricultural Research Service. This leaflet supersedes ARS 52–35, How To Make Up An Economical Dairy Ration.

Washington, D. C. Issued July 1958

U. S. GOVERNMENT PRINTING OFFICE: 1958 O—456217

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 10 cents